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13 JUN 1951

PLANT DISEASE NOTES.

CEREALS AND GRASSES.

DISEASES OF CEREALS IN N.S.W., 1950 SEASON:

W H E A T.

A brief statement on the diseases of the wheat crop in N.S.W. during the 1950-1951 season was given in the previous issue (A.P.D.R. 3:1:1-2,1951). Further notes might be of interest.

At harvest, evidence of infection by primary pathogens was more or less obscured (except in those cases where perithecia were produced late in the season), owing to the extensive colonisation of weak parasites and saprophytes. Species of Leptosphaeria and Pleospora, now under study, were recorded from N.S.W. & Queensland, and Wojnowicia graminis from N.S.W. Colletotrichum graminicolum occurred on basal sheaths and leaves from the coastal areas (H.A.College and Castle Hill) and from the wheat belt. Perithecia of E. graminis tritici were formed at the S.U. plots, where the oidial stage is severe every year. Species of Phoma were present on the glumes, stems and nodes, but inoculations of several isolates on to young healthy seedlings failed to produce disease. Leaves and glumes of many specimens had a "sooty" appearance, the tissues being permeated with mycelium and the surfaces covered with mycelium and spores. The commonest organisms present were species of Alternaria, mostly conforming to A. tenuis sensu lato, and Cladosporium herbarum. Sporodochia of Epicoccum sp. occurred on leaves and glumes from inland and on the coast. Spores of the last three genera were common on spore traps exposed in the North West of the State. Bacteria, many other species of fungi, protozoa and eelworms were present in great numbers on all parts of the plants. This abundant microflora, containing as it did many weakly parasitic and saprophytic forms, was built up in the favourable environment brought about by the high rainfall in most areas, and the early necrosis of leaves due to attack of primary pathogens in the young crop.

O A T S.

Besides the rusts, of which P. coronata was severe especially on the coast, leaf blights caused by species of Septoria (widespread, with high incidence in some areas) and smuts, Helminthosporium avenae was the commonest organism recorded from most areas, although in the majority of cases, damage was only slight. Pseudomonas striaefaciens was observed in the S.U. plots and Pseudomonas coronafaciens at Castle Hill. Colletotrichum graminicolum occurred mainly late in the season

on the coast, and species of Alternaria were commonly found on mature leaves. Darluca filum was particularly severe on the rust from many areas.

B A R L E Y.

Scald, Rhyncosporium secalis, was detected from several areas, some varieties at Castle Hill being severely affected. E. graminis hordei was severe on the coast as usual. Epicoccum species was also recorded on older leaves.

R Y E.

Puccinia dispersa was recorded as usual, and material from Cowra labelled "rye" gave Pleosphaeria semeniperda (Podosporiella verticillata).

- W. L. WATERHOUSE and D. SHAW.

SOME NOTES ON WHEAT RUSTS DURING 1950:

In the northern wheat districts of New South Wales the year 1950 was extraordinary in that, although rainfall was far in excess of any previously recorded, the damage from both leaf rust and stem rust was less than would be expected under such conditions. There was sufficient, however, to allow certain observations to be made on the distribution of the main types of rust occurring in this State.

At the present time it appears that for practical purposes there are four major groups of both stem and leaf rust. Subdivisions of some of these groups have been made and probably can be made in all groups if the time were taken to do so. The stem rusts present can be separated as follows, using Eureka and Yalta as differentials:

Group	Yalta	Eureka	Race Number
1	Resistant	Resistant	126 (Watson & Waterhouse, 1949)
2	Resistant	Susceptible	126 B
3	Susceptible	Resistant	
4	Susceptible	Susceptible	

From glass-house results all can be regarded as biotypes of race 126.

The pattern of the distribution of the varieties Gabo, Yalta, Kendee, Charter and Eureka has had a marked influence on the regional occurrence of these four groups. In the North-Western areas where Gabo, Charter and Kendee have been widely cultivated the frequency of races 126 and 126B is very low. In a series of over 100 single pustule collections made at several places in the above regions all rusts found were capable of attacking Yalta. Collections made at Wagga and Temora through the courtesy of Messrs. Symes, Martin and Russell indicated that 126 and 126B were in much greater concentration than in the North. About 50 per cent of the collections were unable to attack Yalta, Kendee or Charter. They had developed in the absence of any pronounced screening effect of varieties.

At a number of the places in the North-West the high resistance of Eureka early in the season contrasted with the susceptibility of Yalta and Kendee. This was shown to be due to the paucity of inoculum of rusts of group 4, with group 3 predominating. Preliminary glass-house and field tests suggest that rusts of group 4 are poor competitors in mixed populations.

Leaf rust observations almost parallel the stem rust in that four main groups again can be readily identified in the field using Kenya 744 (C 6041) and Gabo as the differentials, thus:

Group	Kenya 744	Gabo	Race Number
1	Resistant	Resistant	95 (Humphrey B.B. et al. 1939).
2	Susceptible	Resistant	26 -do-
3	Resistant	Susceptible	
4	Susceptible	Susceptible	

Groups 3 and 4 are further biotypes of races 95 and 26 respectively. These four groups contain other biotypes separable on additional varieties (Waterhouse, unpublished data). It appears from our observations at various centres in the wheat belt that rusts of group 3 are by far the most abundant, Gabo being universally susceptible with only slight infection on Kenya 744. A moderate degree of infection occurs on this variety later in the season.

- I.A. WATSON and E.P. BAKER.

SOURCES OF RESISTANCE TO CEREAL RUSTS:

STEM RUST OF WHEAT.

The recent occurrence of new biotypes of stem and leaf rust on wheat necessitates the review of all possible sources of resistance to these organisms. In our current work we have found the following varieties of T. vulgare to show very useful resistance to all stem rusts occurring in New South Wales:- Marquillo, Kenya 744, Kenya 117A, Hochzucht, Bokveld, Egypt NA 965, Hofed, Celebration, Rhodesian, derivatives of Timopheevi, Khapli and Agropyron.

In place of Marquillo we are using the selection Marquillo x Waratah x Ford x Early Blackhull made at Glen Innes by Dr. Macindoe.

LEAF RUST OF WHEAT.

The following have been found satisfactory in the field against the 4 groups of leaf rusts present: Mentana, Uruguay, Hofed, Kawvale, Exchange, Chinese, Norka and derivatives of Timopheevi and Agropyron.

CROWN RUST OF OATS.

Resistance to crown rust has been of considerable importance for many years. Victoria and Bond have been valuable parents, but Bond is now susceptible to a race which was common on Bond derivatives in the summer sown plots at Castle Hill in 1949-50. New varieties tested first in the field in 1950 show that there are others having a satisfactory resistance although not as high as that of Victoria. These are Landhafer, Sante Fe and Trispernia. The genetics of resistance in each case appears to be characteristic, and it is possible that by the appropriate technique varieties having the combined resistance may be evolved.

- I.A. WATSON and E.P. BAKER.

VEGETABLES:

"FALSE CLUB ROOT" OF CRUCIFERS:

In 1928 A. W. Bartlett (Trans. Brit. Mycol. Soc. 13: 221-238) attributed the condition known as "Hybridisation Nodules", or "False Finger and Toe" disease of Swede turnips, white turnips, cabbages, Brussels sprouts, rape, kohlrabi and cauliflowers to the organism Olpidium radicicolum de Wildeman.

In the early thirties the present writer examined numerous samples of Swede turnips submitted to the Western Australian Department of Agriculture, Perth, which showed all the characteristic features of (a) marked chlorophyll formation in the nodules, (b) the development of numerous adventitious leaf-bearing shoots from the nodules well below ground level, (c) the absence of any parasite within the tissue of the nodules and (d) the various other features described by Bartlett, except that an Olpidium sp. was never observed. The condition was considered identical with Bartlett's "False Finger and Toe".

In November, 1950, approximately 100% of "Savoy" cabbage plants at Lower Ferntree Gully, Victoria were observed with the typical symptoms described by Bartlett, but again no parasite could be detected in any part of the root system. Perfectly good heads had been cut from these plants in the spring.

The growers on the property concerned have known the condition on their farm, in Savoy cabbages and Swede turnips, for approximately 25 years. They state that on the cabbages no apparent injury to head production is occasioned but with Swedes some loss from malformation occurs.

Some of the affected cabbage roots showed as many as forty adventitious leafy shoots developing from the typical nodules, often as big as a man's fist, formed well below ground level. Most affected roots, however, showed no leafy shoots, or only a few, but the development of chlorophyll in the nodules which have characteristically a finely warty surface like that of "crown gall" swellings, was very common. "Red Pickler" cabbages in the same paddock were entirely free of the nodules. The growers concerned point out that, in the spring, lesions caused by Plasmodiophora brassicae, which is fairly prevalent in the same district, readily decompose, with an offensive odour, but the nodules of "False Club Root" show no signs of decay until the plants are ploughed out or otherwise killed. Seed-bed disinfection is not practised but it is stated that seed-beds are invariably made each year on a new site. The soil type in the large-scale crucifer-growing area concerned is a heavy grey loam overlying a yellow clay, with much ironstone gravel through it, at a depth of about fifteen inches from the surface.

- H. A. J. PITTMAN.

RESISTANCE TO ROOT-KNOT NEMATODE IN TOMATOES AND BEANS:

Trials conducted at Red Cliffs in Victoria on an area of Barmera Sands heavily infected with the root-knot nematode (Heterodera marioni) have confirmed the resistance of the tomato HES 3963. This tomato is a selection from the L. esculentum x L. peruvianum embryo culture cross made by Professor P. G. Smith in California (1). Progeny of this cross were back crossed and selected in Hawaii for resistance to root-knot nematode (2). Fifty plants of HES 3963, and 110 plants of South Australian Dwarf Red were grown at Red Cliffs, Victoria, in the 1950-51 season. All the South Australian Dwarf Red plants had severely damaged roots; using the rating system of Brock and Giles (3) all were rated either three or more. Of the 50 plants of HES 3963, 48 were highly resistant, rated one or less, the other two plants were rated two and three respectively. HES 3963 also appears highly resistant to Fusarium Wilt and crosses have been made with commercial varieties with the object of increasing the size of the fruit.

In the same area a small number of plants of the bean variety Alabama No. 1, which was reported as being resistant to root-knot nematode (4) were grown. This variety had severe gall formation on the roots and appeared to be little more resistant than Epicure which was grown as a check.

1. Smith, P.G. Proc. Amer. Soc. Hort. Sci. 44:413. 1944.

2. Frazier, W.A. and Dennett R.K. Ibid. 54:225. 1949.

3. Brock, R.D. and Giles J.E. J. Aust. Inst. Agric. Sci. 15:154. 1949.

4. Isbell, C.L. J. Heredity 22:191. 1931.

- R. D. BROCK

DISEASE IN NORFOLK ISLAND CARROT CROPS:

In a previous issue of this publication (A.P.D.R. 2:2:20, 1950), it was reported that carrot crops seen on Norfolk Island in October, 1949 were apparently free from all disease including the carrot virus disease first described in Victoria. In November, 1950 a small percentage of plants in several crops were seen with symptoms highly suggestive of the carrot virus disease. The incidence of the disease, however, was very much less than commonly seen in carrot crops in the Sydney Metropolitan Area at the same period of the year. Aphids and other insects were more prevalent on the Island in November, 1950 than in October, 1949 and this may have been responsible for the fact that symptoms suggestive of the carrot virus disease were seen during the 1950 visit and not previously. Leaf spot (Cercospora carotae) was also seen in two crops - one commercial seed crop and one home garden planting.

The writer agrees with L.L. Stubbs (A.P.D.R. 2:3:37, 1950), that the growing of carrot seed in a locality in which the carrot virus disease occurs is an easy and useful method of ensuring that the percentage of the more susceptible types within any so-called tolerant variety is kept at a low level. However, it could be a better economic proposition, provided adequate attention could be given to seed production in the matter of testing and selection of strains to grow such a variety where the disease does not exist, or where its incidence is low, and thus obtain higher seed yields.

- R. D. WILSON.

FRUIT.

CHERRY LEAF SPOT: COCCOMYCES HIEMALIS HIGGINS:

The first report of this disease in N.S.W. was made by Hutton (A.P.D.R. 2:2:22, 1950).

The potential of the disease can be estimated by the very high infections in the four nurseries concerned.

Attention of pathologists is drawn to work by Peterson and Cation (American Plant Disease Reporter 34:1:5-6, 1950) reporting exceptionally good control of the disease by the use of the antibiotic acti-dione. Even at concentrations of 1 p.p.m. only 1 per cent of lesions remained active five weeks after spraying.

It is suggested that this material may be an effective way of cleaning up the small amount of disease which may have escaped the original eradication and quarantine of 1950.

To the writer's knowledge the only source of this material, other than sample quantities from the manufacturers for research investigations, is Ivon Watkins Ltd., New Plymouth, New Zealand, who have small quantities.

The quoted price in America in early 1950 was $2.50 per gramme. At this price and using 1 p.p.m., which gives 215 gals. of spray per gramme, the cost is approximately fourpence per mature tree for spray materials.

Triton B-1956 has been used effectively as a spreader.

- J. H. E. MACKAY.

ORNAMENTALS.

DOWNY MILDEW ON DIANTHUS:

In June 1950, a specimen of Dianthus received at the Plant Research Laboratory, Burnley, was found to be affected by Peronospora sp. This appears to be the first record of a downy mildew on Dianthus in this State. The disease had caused considerable death of foliage of the specimen, but the stems remained quite green and rigid.

The specimen was received from Freshwater Creek, via Geelong.

- H. FREEMAN.

MISCELLANEOUS NOTES.

A FREELY SPORING ISOLATE OF ALTERNARIA SOLANI:

The writer has been fortunate enough to obtain an isolate of this fungus which sporulates freely on potato dextrose agar or potato dextrose peptone agar under normal incubation at 25° C.

The culture was brought to Australia by Professor P. A. Ark (University of California) who is at present working on antibiotics at the Commonwealth Serum Laboratories, Melbourne. It was isolated as a naturally sporing strain from infected tomatoes and is, according to Professor Ark, highly pathogenic and simple to use in inoculation work.

It is kept in the conidial stage by making transfers from a spore suspension. This is obtained by covering the slope with sterile water and vigorously rolling between the hands. The slope surface should not be disturbed by stroking with a needle or rod since mycelial transfers are apt to enter the vegetative stage. Slopes are inoculated by flooding with spore suspension and draining, inoculations being made in series over a number of tubes.

Should any pathologist desire a culture of this strain, it can be obtained by contacting the writer at C.S.I.R.O., Division of Plant Industry, Box 109, City, Canberra, A.C.T. A culture will be deposited in the culture collection at C.S.I.R.O., Canberra.

- J. H. E. MACKAY.

THE USE OF CRYSTAL VIOLET TO ELIMINATE BACTERIAL CONTAMINATION:

During a programme of isolation of soil fungi to determine the presence of soil borne plant pathogens it has been found difficult in many cases to obtain fungal cultures free from soil bacteria.

Various bacterial inhibitors were incorporated in potato dextrose agar and tested for efficiency in controlling bacterial growth but not affecting appreciably the growth rates of the desired fungi.

As a routine measure crystal violet gave most satisfactory results and the method, similar to that described by Martin (Soil Science 69:3:215-232, 1950), is as follows:-

Crystal violet is added to bulk medium at the rate of 10 parts per million. This can be done either before or after autoclaving, since sterilisation does not cause any variation in results. Contaminated cultures are inoculated centrally to the plates and incubated at the required temperature (25° C. is most commonly used here). Plates are observed 48 hourly and when sufficient growth has occurred fungal tip transfers are made. Dependent on the observed purity of the mycelium these are made either to further crystal violet plates or to acidified plates.

Before any culture is considered clean and is transferred to normal medium it is grown once on P.D.A. plates treated with lactic acid. Lactic acid does not inhibit bacteria as effectively as crystal violet and these plates serve as a check on the effectiveness of the treatment.

Crystal violet causes some reduction in fungal growth rate, but to date no fungus used has been intolerant of the recommended concentration.

- J. BROCKWELL.

VIRUS INOCULATION TECHNIQUES:

Whilst overseas, I had the opportunity of observing various hand inoculation techniques for transmission of plant viruses and was impressed by the lack of standardisation. Some dip their fore-finger in the inoculum and others use a glass spatula, and the types of abrasives vary considerably. Two techniques of promise are the use of "Celite Analytical Filter Aid" as an abrasive, and the use of tri-sodium phosphate as a virus-inactivating agent for washing implements used in virus inoculation. "Celite" is light and can be kept suspended in the inoculum with a minimum of agitation so that dusting the leaves can be omitted, and a standard quantity used during inoculation. Tri-sodium phosphate used as a 20 per cent solution has a number of advantages as a sterilising agent over the fairly widely used formalin. Experiments here have confirmed the superiority of tri-sodium phosphate over formalin, and the abrasive efficiency of "Hyflo-supercel" which can be bought in Australia.

- E. M. HUTTON.

EXPERIMENTS ON VIRUS TRANSMISSION:

Experiments on the transmission of big bud of tomato and yellow dwarf of tobacco commenced in 1948 by A. V. Hill and G. P. Kelenyi were continued under greenhouse conditions at Canberra.

Dodder (Cuscuta campestris) grown on diseased plants was allowed to parasitise healthy plants for 30-40 days before the strands were disconnected; alternatively, individual pieces of dodder growing on diseased plants were detached and established on healthy plants. Big bud transmission was obtained readily by either method and appeared to be favoured by high temperature and humidity. Symptoms on dodder-infected plants usually appeared in 60-150 days. Diseased dodder retained its ability to infect healthy plants. There was no evidence that either virus was transmitted through dodder seeds.

Big bud has been transmitted by dodder from tobacco to tobacco, tomato, datura, sugar beet and Vinca rosea, and from each of these plants to most of the others listed.

In contrast with the success obtained with transmission of big bud, repeated attempts to transmit yellow dwarf of tobacco by dodder have failed. Both viruses are readily transmissible by grafting and budding and both are transmitted by the same insect vector Orosius argentatus (Evans). Under greenhouse conditions, big bud is transmitted by the insect vector fairly readily and yellow dwarf less frequently. This is considered to be due in part to the much wider range of host plants susceptible to big bud and acceptable also as feeding plants, whereas the vector tends to avoid tobacco and will not survive on it.

- M. MANDRYK.

USE OF THE WORDS "RESISTANCE" AND "TOLERANCE":

As one who supplied the incentive for N. H. White's note on correct usage of the terms resistance and tolerance (A.P.D.R. 2:4:54, 1950) the writer feels obliged to offer the following comments:-

It is obvious from R. D. Wilson's comments on the above note (A.P.D.R. 3:1:16, 1951) that in spite of definition of these terms in both England and U.S.A., it is still possible to disagree on the interpretation of their meaning in plant pathology.

In the first reference quoted by Dr. White, a Committee on Technical Words appointed by the American Phytopathological Society, defined the terms as follows: Resistance, as "ability of an organism to withstand or oppose the operation or to lessen or overcome the effects of an injurious or pathogenic factor. Ability of the host to suppress or retard the activity of a pathogenic organism or virus", and tolerance, as "ability of the affected organism to endure the operation of a pathogenic factor or invasion by a pathogenic organism or virus with little or no reaction, as shown by the more or less complete absence of symptom expression or damage".

The loose wording of the first definition certainly does not convey the impression suggested by Dr. White that "in resistant plants the pathogen or virus fails to establish itself even if it gains entry", but rather that degrees of resistance are recognized. If the latter interpretation is accepted, then the only essential difference between the wording of both definitions is that tolerance implies that the host is able to withstand, but not oppose, the operation of a particular organism.

However, this assumption may not be correct. In one instance, the writer has some evidence that the concentration of virus in a tolerant variety may be lower than that in a susceptible variety. Should this evidence be confirmed by future work, then acceptance of the above definitions would not preclude a host from being resistant or tolerant, or both.

In virus terminology it would appear safer, therefore, to avoid using the word resistance when describing the reaction of a host to infection. When addressing the layman, however, resistance conveys more meaning than tolerance.

A host which permits the entry and multiplication of a virus would be either susceptible or tolerant according to its reaction to the pathogen. A rigid definition based on symptom expression alone may be undesirable. It is conceivable that a plant could have a useful degree of tolerance, as evidenced by vigour and yielding ability, and yet be discarded in a resistance (tolerance ?) trial based on symptom manifestation.

- L. L. STUBBS.

RINGING AGENTS:

It was noted in the interesting article by Butler (A.P.D.R. 3:1:17-18, 1951), that Dade of the C.M.I. is experimenting with nail lacquer as a ringing agent. When the use of this agent was noted in the literature last year, it was tried, and so far has proved quite satisfactory. One advantage with the lacquer is that it can be obtained in several colours, and so various sets of slides can be easily differentiated.

Asphaltum, or asphalt varnish ("The Microtomists Vade-mecum" 9th Edition p.237) which has proved most satisfactory in the past, is still used as the ringing agent for glycerine jelly mounts. It is applied easily and efficiently with a camel-hair brush, the slide being clamped on to a simply-constructed ringing table designed by W. L. Waterhouse. As mentioned by Dade and Waller (Mycological Papers No. 27), difficulty is experienced in successfully ringing lacto-phenol mounts, even with asphaltum, as the varnish will run under the coverslip on occasions, although the slide and coverslip may be quite dry. Waller's Cement No. 1, consisting of equal quantities of gum dammar and beeswax, has not been tried here as yet.

- D. SHAW.

SMUTS OF AUSTRALIAN PLANTS:

I am preparing a monograph on Australian Smuts and wish to have as large a collection of material as possible. It would be appreciated if readers would send to me at the Department of Botany, University of Queensland, Brisbane, any smutted plants that they encounter. Because identification of the hosts is important, healthy specimens of the smutted species should be submitted at the same time. Cultivated and ornamental plants as well as native species with smut are wanted.

- R. F. LANGDON.

TYPE CULTURE COLLECTION OF PLANT PATHOGENS:

It is regretted that owing to shortage of staff, no further contributions to the above Collection can be accepted until further notice. It is hoped that a research trainee will shortly be appointed to undergo post-graduate training in taxonomic mycology, at the conclusion of which he will take charge of the Collection. It has been found impracticable to maintain any more cultures than those already received until a permanent curator is available.

- W. V. LUDBROOK.

COMMONWEALTH MYCOLOGICAL INSTITUTE NOTES.

SOME C.A.B. PUBLICATIONS IN PRESS OR PREPARATION:

1. Studies on Hyphomycetes.
2. Indian Ustilaginales.
3. Leaf curl diseases of Cotton.
4. Climatology in relation to crop production and behaviour.
5. The association of ants with coccids and aphids and its economic significance.
6. Fungus diseases of animals.

CHAIRMAN OF THE C.A.B. EXECUTIVE COUNCIL:

It is of interest to record that an Australian, Mr. J. E. Cummins, has succeeded Sir Patrick Laird as Chairman of the Executive Council. Mr. Cummins is at present in charge of the Australian Scientific Liaison Office in London.

CHANGE OF ADDRESS OF C.A.B. HEAD OFFICE AND CENTRAL SALES BRANCH:

The head office of C.A.B. was formerly in London and the Central Sales Branch was at Aberystwyth. The present address of both is:

Commonwealth Agricultural Bureaux,
Farnham House,
Farnham Royal,
Nr. Slough, BUCKS, ENGLAND.

- C. J. MAGEE.